

Learning Point

## Hallucinations in a child: A case demonstrating the pitfalls of urine dipstick drug testing

Arlene Boroda MBBCh, FRCPCH (Consultant Paediatrician) \*,  
Ribena Akhter MBBChB, MRCPCH (Paediatric Registrar)

*Department of Paediatrics, Northwick Park Hospital, Watford Road, Middlesex, United Kingdom*

Received 24 February 2007; received in revised form 15 June 2007; accepted 5 July 2007

Available online 18 September 2007

### Abstract

We describe a child who presented with hallucinations in whom urine dipstick testing was positive for amphetamines. As a result the child protection team were involved. Subsequently, the urinalysis done by gas chromatography showed no amphetamines but a large quantity of ephedrine. The child had been given cough mixture which contains ephedrine. A cross-reaction had occurred between ephedrine and amphetamine when using the urinary dipsticks. This case highlighted the importance of clinicians being aware of the diagnostic accuracy and pitfalls of the investigations requested. In particular, this is critical when the results of such tests have such far reaching medicolegal and social consequences.

© 2007 Elsevier Ltd and FFLM. All rights reserved.

**Keywords:** Hallucinations; Urine dipstick for drugs; Child protection

### 1. Introduction

We present a seven-year-old boy who presented to our paediatric ambulatory care unit with hallucinations. He awoke seeing flies in his room and over his body. He had recently had a mild cough but no fever. He had been given 5 ml of “Benlyn Cough and Congestion” syrup less than 24 h previously by his stepmother.

He had presented to hospital approximately one year previously having allegedly been bitten by a cousin. Other past medical history included infrequent episodes of secondary enuresis and “behavioural problems” for which he had been recently referred to the behavioural clinic at the hospital. He was not on any regular medication. There were no developmental concerns. On examination, he was alert and orientated. Physical examination findings were unremarkable, including normal pupils. Clinical observa-

tions were within normal limits. Heart rate was 90 beats per minute.

### 2. Investigations

Baseline biochemical and haematological test results were all normal. An electrocardiogram showed normal sinus rhythm and no tachycardia. Four separate urine samples were tested using dipsticks of Accusign DOA4 analysis kits (Chirus Ltd., Princeton, US), and were all positive for amphetamines. A further urine sample was sent to the toxicology lab for analysis. Urine pH was normal at 6.5.

### 3. Medical management

The child was admitted for observation in the children’s ward. The above findings were discussed with the parents, and no possible source of amphetamines was identified on history. He had a further episode of hallucinations during which he saw flies. Clinical findings remained consistently normal.

\* Corresponding author. Tel.: +44 2088 692999.

E-mail address: [Arlene.Boroda@nwlh.nhs.uk](mailto:Arlene.Boroda@nwlh.nhs.uk) (A. Boroda).

Because of the urine dipstick test being positive for amphetamines, we involved social services and child protection police, as amphetamine is a class A/B drug whose possession carries severe penalties by law. The possibility of deliberate or accidental ingestion was considered. The family were fully informed and accepted the need for referral to social services. A multi-agency strategy meeting took place. The child remained in hospital for medical observation.

Toxbase ([www.spib.axl.co.uk](http://www.spib.axl.co.uk)), a UK database of information for the assessment and management of poisoning, states that small doses of amphetamines can cause euphoria, increased alertness, and boosting of self-esteem. Larger doses of amphetamines cause sweating, dilated pupils, agitation, confusion, headache, abdominal pain, seizures, palpitations, narrow-complex tachycardia, delusions and hallucinations. Coma, cerebral vasculitis and hepatocellular damage are rare effects. Toxbase recommends administration of activated charcoal if 10–15 g of amphetamine is ingested and the child presents within 1 h of ingestion. Our patient had none of these features and had no further hallucinations.

The following day, gas chromatography of the urine sample showed no amphetamines but a high level of ephedrine.

The parents insisted that he had only been given 5 ml of “Benylin Cough and Congestion” syrup. The possibility of an idiosyncratic reaction was considered. The child remained physically well with no further episodes. The results of gas chromatography were discussed with the family and social services. Following their assessment, the child was allowed home to his parents.

#### 4. Discussion

Ephedrine (Fig. 1) is a sympathomimetic beta-1 adrenergic receptor agonist that increases the level of noradrenaline. Structurally, it is similar to amphetamine (Fig. 2). There have been many cases of ephedrine use in athletes,

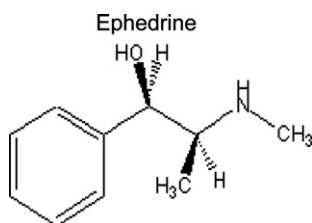


Fig. 1.

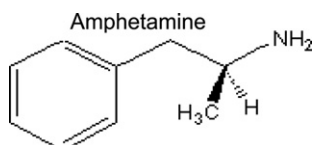


Fig. 2.

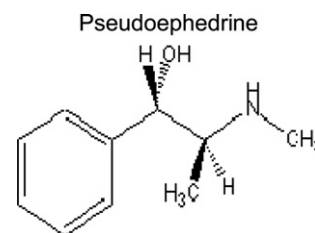


Fig. 3.

taken either as a performance-enhancing agent because of its sympathomimetic action or incidentally as part of cold remedies. Ephedrine is a banned substance for athletes, and disqualifications have occurred. Systemic side effects of ephedrine include pallor, hypertension, excitement, restlessness, rapid speech, dilated pupils, convulsions, tachycardia and hallucinations. Muscle tone and reflexes are increased. In practice, we have seen children presenting with hallucinations in isolation due to cough mixture ingestion.

When contacted, the company who produces the urine dipsticks told us they were 99% sensitive and specific, but that this was based on adult urine testing and they had no figures for a paediatric population. They reported having had only one previous case in the USA of a false-positive test with amphetamines cross-reacting with ephedrine, but insisted that the quantity of ephedrine would have to be >100,000 pp/ml. Unfortunately, the lab did not measure exact quantities and discarded the urine sample. A discussion with a toxicologist working for the Forensic Science Service in the UK confirmed that it is not uncommon for a cross-reaction between amphetamines and ephedrine using urine dipsticks. Therefore, laboratory analysis of urine is necessary.

Pfizer, the company that produces “Benylin Cough and Congestion” syrup writes that the preparation contains diphenhydramine hydrochloride, dextromethorphan hydrobromide, levomenthol and pseudoephedrine hydrochloride. The maximum daily dose in a child of 6–12 years of age is 20 ml.

Pseudoephedrine (Fig. 3) is a stereoisomer of ephedrine and has a similar action. It is a sympathomimetic agent with direct and indirect actions on adrenergic receptors. It has a more prolonged, though less potent action than adrenaline. However, pseudoephedrine has been stated to have less pressor activity and central nervous system effects than ephedrine. Pseudoephedrine hydrochloride is rapidly and completely absorbed from the gastrointestinal tract after oral administration. Its half life is between 5 and 8 h and ~70% of the dose is excreted in urine in 36 h, with less than 1% as norpseudoephedrine and the remainder unchanged. Side effects of pseudoephedrine reported in Toxbase are drowsiness, dizziness and gastrointestinal upset. Its less marked pressor effect may explain why no cardiovascular or other neurological side effects were seen in our patient.